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	R.A.		N.P.D.			
			N.P.D. Increasing		N.P.D. Decreasing	
Year.	Uncorrected.	Corrected.	Uncorrected.	Corrected.	Uncorrected.	Corrected.
1871 Gr.	+0·448	+0·019	+1·93	+0·15	−2·49	−0·70
1872 „	+0·478	−0·002	+2·16	+0·07	−2·93	−0·64
1873 „	+0·522	−0·008	+3·09	+0·75	−3·11	−0·46
1874 „	+0·597	+0·026	+3·28	+0·64	−3·53	−0·44
1875 „	+0·649	+0·026	+3·03	+0·03	−3·40	−0·15
1876 „	+0·637	−0·040	+4·11	+0·57	−3·05	+0·73
1877 „	+0·585	−0·146	+4·76	+0·68	−2·95	+0·54
1878 „	+0·530	−0·251	+4·47	+0·22	−2·29	+1·32
1879 „	+0·613	−0·241	+4·25	+0·41	−3·32	+0·48
1880 „	+0·663	−0·232	+3·66	−0·27	−3·44	+0·34
1881 „	+0·687	−0·266	+3·30	−0·40	−3·98	0·00
1882 „	+0·82					
1882 Rad.	+0·858	−0·162	+2·73	−0·83	−3·44	+0·70
1883 „	+0·982	−0·095	+2·60	−0·81	−3·06	+0·75

On the Proper Motions of Forty Stars in the Pleiades, both Absolute and Relative. By Prof. C. Pritchard, D.D., F.R.S.

(*Abstract.*)

The Memoir which I am about to present to the consideration of the Society, consists mainly of two separate and entirely independent investigations of the proper motions of forty stars in the *Pleiades*. It originated primarily in a desire to test the capacity of a new Differential Micrometer which I had devised, under the expectation that it would enable me to measure with great accuracy celestial arcs to the extent of some twenty minutes; a distance which seemed to me considerably greater than could be reached with security by means of any filar micrometer with which I was acquainted. I purposed to apply this new form of micrometer, if successful, to a systematic investigation of stellar parallax, which I then intended to make an especial object of research, in the observatory under my direction at Oxford. I applied the instrument in the first instance to the *Pleiades*, in consequence of a remark* made by Bessel, to the effect that his own measures of the relative coordinates of certain members of this historic group had been effected with so much accuracy by means of his heliometer, that advantage might henceforth be taken of his scrupulous labours therein, to test the accuracy of other instruments, and, at the same time, assist in determining their scales.

I had proceeded to a considerable extent in this investigation

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* Beobachtungen verschiedener Sterne der Plejaden, 'Astronomische Untersuchungen,' erster Band. S. 209.

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when, becoming satisfied with the capacity of the new micrometer, I resolved to still further utilise the observations by widening the scope of the work, and by embarking on a systematic measurement of the relative positions of the more prominent members of the group, with the view of ascertaining their relative proper motions since the time of Bessel's heliometer measures made some forty years ago.

The instrument in question affords the means of measuring arcs with equal facility in the three coordinate directions of Right Ascension, Declination, and Distance. Consequently, if all three were measured, there would arise at once the means of testing the accuracy of the observations. This seemed to me to be a great gain, and I have uniformly applied this test to the observations recorded in the present Memoir.

Such, then, are the circumstances under which the research commenced. As I proceeded with it, and endeavoured to make it complete, the questions before me widened out, and new objects of research presented themselves in close connection with the original inquiry. It became desirable for instance to record the relative magnitudes, or degrees of lustre, presented by the members of the group subjected to the micrometer. Estimations made by the eye on these objects as viewed in the field of the telescope, seemed to me to be eminently unsatisfactory. In support of this remark, I may mention that out of estimations made by eminent observers, such as Flamsteed, Bradley, Mayer, Piazzi, Bessel, Argelander, and Wolf, no two agree in the order of the relative brightness of the eight principal stars in the cluster.* These considerations led me to the invention of the photometric method of measurement of relative brightness by means of the '*Wedge Photometer*,' and this has already appeared in the Memoir on the subject, printed in the last volume of the Society's Transactions, and which I trust, before long, to complete as a new Uranometria of all the stars visible to the naked eye from the Pole to the Equator.

In the course of the reduction of the micrometer measures another question also not unnaturally arose. The results thus obtained are from *differential* observations. But scattered about in the records of many observatories, from the time of Bradley downwards to the present time, there are numerous observations of several members of the group, made with meridian instruments, and affording reliable measures of their absolute Right Ascensions and Declinations. If therefore these valuable observations, made at different epochs and by various observers of great eminence, were reduced on a uniform and systematic plan, it would thereby be possible to deduce the present coordinates and the proper motions of the objects to which these observations refer. The work, I felt, would be somewhat laborious; but it would supply the means of an interesting and

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* Description du groupe des Pléiades, par M. C. Wolf, p. A 24.

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somewhat novel intercomparison between the results obtained by a long series of meridian observations, and those accruing from differential measures, made away from the meridian. Accordingly I was led to undertake the task, the numerical results of which are now complete and ready for presentation to the Society.

There are fourteen stars in the *Pleiades* whose places have been sufficiently obtained by meridian observations. They extend for the most part through a period of one hundred and thirty years, and are worthy of various and perhaps of determinable degrees of reliance. In systematically effecting their reduction, I have followed and somewhat extended the plan pursued by Argelander in the seventh volume of the Bonn observations, largely availing myself of the facilities afforded by the later labours of Professors Newcomb and Boss. The result of this section of the present research, consists in the determination of the most probable absolute coordinates and proper motions of the fourteen stars in question. These proper motions thus obtained from the best existing meridian observations, are then compared with those resulting from micrometrical measurements. For the latter purpose recourse is had to the heliometer measures made at Königsberg between 1838–41; to a very valuable set of differential measures made at Paris by Dr. Wolf in 1874; and to the measures made at Oxford with the 'Duplex Micrometer' between 1878–1880.*

These three sets of observations are combined together by means of equations of condition; and, as in the case of the forementioned meridian work, furnish at once the most probable relative coordinates of the forty stars in question, together with their relative proper motions.

The final results of these investigations are as follows:—First, with regard to the fourteen stars which have been measured by the two thoroughly independent processes; the general accord of the final results points unmistakably to the existence of certain small motions of these stars *inter se*; but of so slight an amount, that their exact determination does not seem fully within the reach of observations as yet extant; these must be left for the effects of a greater lapse of time, which shall make them more directly apparent in amount, and to the astronomy of the future. Of the remaining stars, although meridian observations do not at present exist so as to corroborate the evidences of relative motion afforded by the combined micrometer measures made at Königsberg, Paris, and Oxford, nevertheless the fact of these minute displacements is, I think, now established beyond

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* In addition to these, there is another apparently valuable set of measures made at Washington about the year 1860. These observations, however, do not appear to have been systematically reduced. In the Washington Catalogue for 1860, the absolute coordinates are given, but the information there supplied is, I regret, not sufficient to enable me to combine them with the other series of coordinates here mentioned.

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doubt. An independent confirmation of these results is also obtained from a comparison of '*distance*' measured at Königsberg and at Oxford.

Another remark also occurs, which is this: the relative displacements of these distant suns, although not distinctly and accurately measurable in numerical extent, appear to vary both in direction and amount; indicating thereby the mutual influence of a group of gravitating bodies, and not simply that common motion of the whole which would necessarily arise simply from the translation of the solar system in space.

In further connection with the completion, for the present, of this very interesting inquiry into the observable motions of a cosmical system, I may take this opportunity of stating, that I have laid the foundation for a similar enquiry, destined for the astronomers of the future, by making with scrupulous care, in the University Observatory, a series of observations of the relative positions of some 250 stars of a cluster in *Cygnus* (39 Messier), which I hope, in due time, to communicate to the Society. Perhaps these measures, after the lapse of a century or more, may, like Bradley's observations, made 130 years ago, again serve to trace the effects of gravitation, in systems of suns, possibly detached from our own.

Oxford: 1884 *May* 8.

Observations made at the U.S. Naval Observatory, Washington.
By Prof. Asaph Hall.

(*Communicated by Commodore S. R. Franklin, U.S.N., Supt.*)

CONJUNCTION OF THE SATELLITES OF SATURN.

Date.		Wash. M.T.	Position.	Wt.	Remarks.
		Mimas.			
		h m			
1883 Dec.	3	10 55·8	S.p.	3	
	3	12 10·8	S.p.	3	
	6	9 19·9	S.	3	
1884 Jan.	26	6 40·8	S.	3	
Feb.	1	9 46·5	N.	3	
		Enceladus.			
1883 Dec.	6	9 44·4	N.	3	
	17	8 42·3	N.	3	
	28	7 45·9	N.	2	
1884 Jan.	21	7 6·7	S.	3	
Feb.	1	6 18·0	S.	3	
	18	9 25·6	N.	3	
	29	8 35·1	N.	3	